

**PARTITION COEFFICIENTS FOR Al, Ca, Ti, Cr, AND Ni IN OLIVINE
OBTAINED BY MELTING EXPERIMENT ON AN LL6 CHONDRITE;**

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We report the partition coefficients for Ca, Al, Ti, Cr, and Ni in olivine obtained through a series of melting experiments on an LL6 chondrite under varying conditions of temperature and oxygen fugacity. It is necessary to examine the variation of partition coefficients up to extremely reducing conditions in order to study meteoritic olivines. For Ca, Al, and Cr, the partition coefficients tend to decrease as temperature increases, but do not change as oxygen fugacity changes. The partition coefficient for Cr does not change even under extremely reducing conditions.

The starting material for the heating experiments was the PCA 82507 LL6 chondrite. The experiments were originally designed to obtain information on the magma compositions of the HED meteorites from LL chondrite-like source material [1]. In these experiments, powdered samples suspended on Pt-wire loops were heated at constant temperatures of 1050, 1125, 1200, 1275, 1350, 1425, and 1500 °C in a vertical 1-atm CO/CO₂ gas-mixing furnace at constant oxygen fugacities ranging from 3 log units below to 4 log units above the iron-wüstite (IW) buffer. Oxygen fugacity was measured by a zirconia cell, although the measured values of oxygen fugacities less than 2 log units below IW may be somewhat inaccurate. Details of these experiments are described by Lofgren [2]. Chemical analysis of experimental charges was made with an electron microprobe.

Fig.1 shows the weight ratio partition coefficients for olivine/liquid (glass) as a function of oxygen fugacity and temperature. The partition coefficient for Mn obtained by these experiments has been already reported in Miyamoto et al. [3]. The partition coefficients for Ti and Ni may be somewhat inaccurate, because the amounts in olivine are close to the detection limits. Our experiments cover relatively reducing conditions. The ranges of the partition coefficients we obtained are consistent with those previously reported by several investigators [e.g., 4]. Our results for Ca, Mn, and Cr are in good agreement with those obtained by melting experiments on angrite compositions [5].

For Ca, Al, and Cr, the partition coefficients tend to decrease as temperature increases, but do not change as oxygen fugacity changes. The partition coefficient for Cr does not change even under extremely reducing conditions and is below 1.0 for the charges heated over 1200 °C except for the 1350 °C one at log fO_2 = -13. The partition coefficient for Ti tends to increase under extremely reducing conditions. The partition coefficient for Ni drastically changes and is very low under the reducing conditions. Temperature dependency of the partition coefficients for both Ti and Ni is unclear.

These data can provide a clue to explain zoning profiles of meteoritic olivines.

References:

- [1] Miyamoto M. et al. (1986) *Lunar Planet. Sci. XVII*, 563-564. [2] Lofgren G. E. (1983) *J. Petrol.*, 24, 229-255. [3] Miyamoto M. et al. (1993) *JGR*, 98, 5301-5307. [4] Irving A. J. (1978) *GCA*, 42, 743-770. [5] Mikouchi T. et al. (1994) This volume.

PARTITION COEFFICIENTS FOR OLIVINE: Miyamoto M. et al.

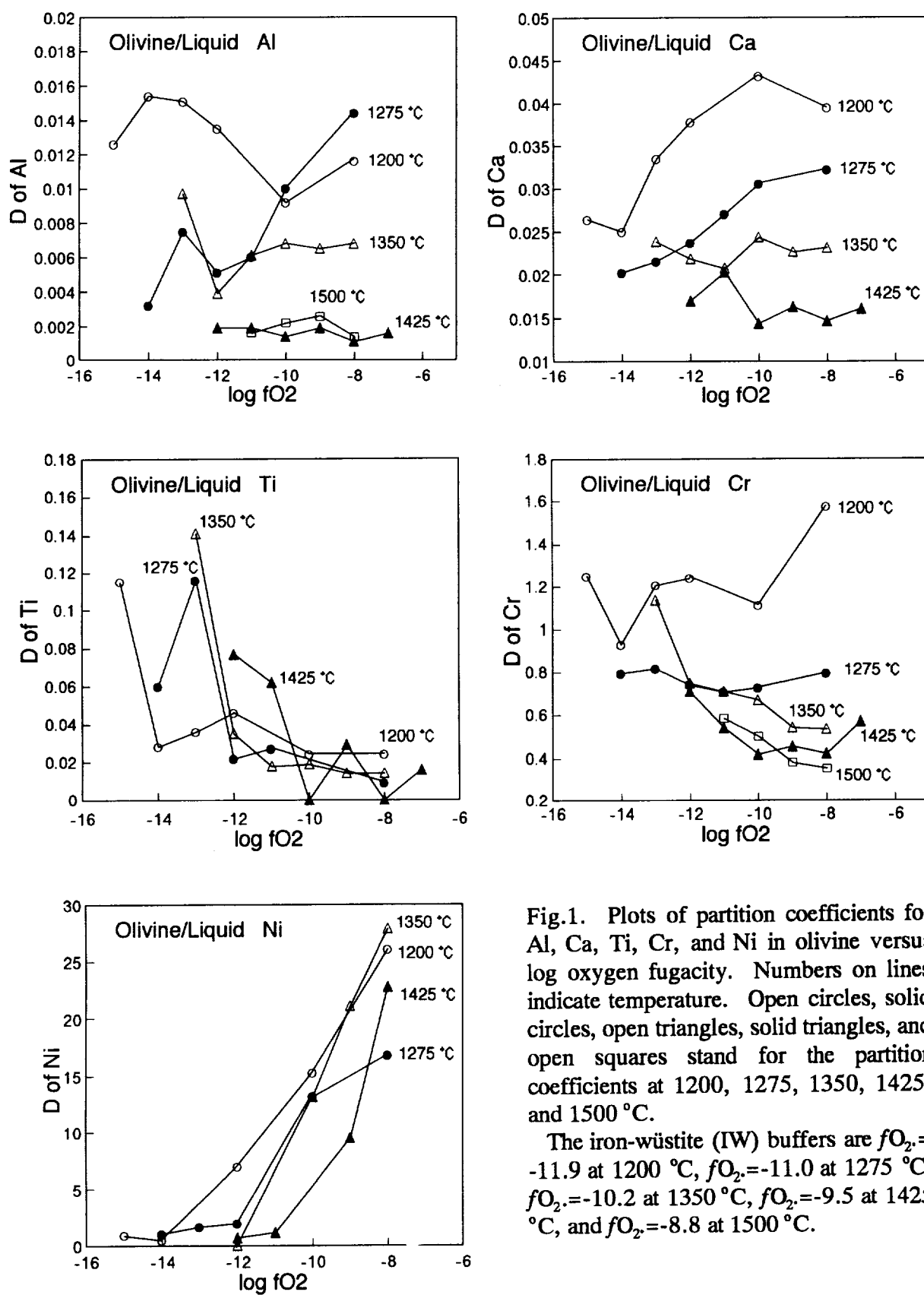


Fig.1. Plots of partition coefficients for Al, Ca, Ti, Cr, and Ni in olivine versus log oxygen fugacity. Numbers on lines indicate temperature. Open circles, solid circles, open triangles, solid triangles, and open squares stand for the partition coefficients at 1200, 1275, 1350, 1425, and 1500 °C.

The iron-wüstite (IW) buffers are $fO_2 = -11.9$ at 1200 °C, $fO_2 = -11.0$ at 1275 °C, $fO_2 = -10.2$ at 1350 °C, $fO_2 = -9.5$ at 1425 °C, and $fO_2 = -8.8$ at 1500 °C.